Public Policy and Future Population in Ontario

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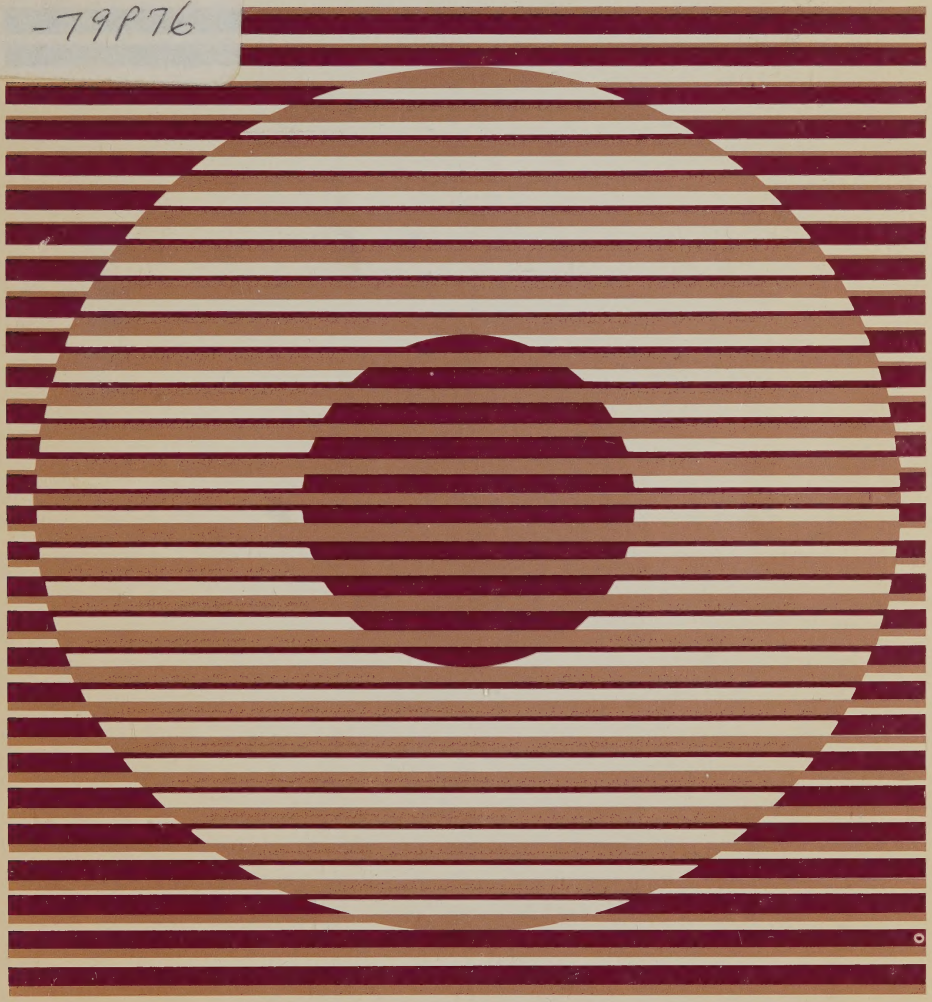
Council

D. K. Foot

Discussion Paper Series



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and
FUTURE POPULATION IN ONTARIO

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1 INTRODUCTION

The economic implications of the declining rate of population growth, a result of the drop in fertility rates since the early 1960s, and of the consequent aging of the population are only just beginning to be systematically explored in detail. Not that this is a new subject of economic enquiry - the pioneering work of Malthus made it one of the foundations of economics. But it is a topic currently being 'reborn' on the upswing of the familiar Kuznets cycle.[1]

In Canada the relatively high rates of immigration in the sixties and early seventies effectively postponed the economic impacts of reduced population growth and perhaps delayed as well the need for appropriate analysis and policy. Possibly these developments obscured the changes in population until they were brought to light by the economic events of the mid-1970s. Whatever the reason, analyses of the economic consequences of declining population growth and population aging are once again appearing in the literatures of both theoretical and policy economics[2].

Projections of a slowdown in the future rate of population growth in Canada were well established by the mid-1970s (Statistics Canada, 1974), though it has since been found to be even more pronounced than expected (Statistics Canada, 1979b).[3] At the same time the macroeconomic effects of the projected slowdown on labour force growth and on the future output potential of the economy were being debated (Foot, 1975; McCracken, 1975). The expected aging of the population was

1 See Kuznets (1958). A similar rebirth also appears to have followed the drop in fertility rates during the years of the depression; see, for example, Keynes (1937), Reddaway (1939), and Robinson (1951).

2 For a recent survey of some of these developments see Clark et al. (1978).

3 It is interesting to note that during the upswing in population growth during the 1950s and 1960s, population projections were invariably too pessimistic; see Keyfitz (1972, 357-8).

explored (Auerbach and Gerber, 1976) and certain possible effects on public policy were outlined (Stone and Marceau, 1977). It was noted, for example, that labour force growth would be maintained by a continuing increase in female participation rates and by a movement of the most populous age groups first into the labour force and later into the age groups with traditionally higher participation rates. As a consequence labour force growth, although declining, was projected to continue to be above population growth well into the 1980s, presenting a challenge to those responsible for job creation (Foot, 1975).

The national trends were projected to be experienced to a slightly greater or lesser degree regionally throughout the country (Statistics Canada, 1974). Analyses of the trends specifically for Ontario documented the changing composition of the province's population and its likely impact on labour force growth (Dallimore and Lampert, 1973; Ontario, 1976a; Foot, 1977b). Extensions to the country and municipality levels were also developed (Ontario, 1977a).

These population projections have since been revised downwards (Statistics Canada, 1979b; Ontario, 1978a), largely because of the continued decline in fertility rates and perhaps also because of recent developments in immigration policy.[4] Whether further revisions of this sort will be warranted is a matter for considerable debate in both theoretical and policy discussions.

Accurate macroeconomic forecasting is essential for economic planning and decision-making in any organization, whether in government (federal, provincial, or local), in government agencies (for example Ontario Hydro), or in private corporations. Since population trends help determine both the supply side (via the labour force) and the demand side (via investment and consumer spending) of the economic environment, population projections are crucial in economic planning. The

4 For a review of some of these developments see Canadian Public Policy, 1, No. 3 (Summer 1975); see also note 3 above.

changing composition of the population and labour force will be especially important to organizations concerned with the production of goods or services that can be identified with specific age groups in society (such as education).

The current economic literature on these developments (see Clark, Kreps, and Spengler, 1978, for a survey) is far from comprehensive, although some integration of the detailed demographic information with macroeconomic and microeconomic information both theoretically and empirically has been attempted (for example, Denton and Spencer, 1975b). Macro-econometric models embodying this information can provide a useful overview of the wider implications of changing demographic patterns.[5] A number of sector-specific studies have appeared (e.g. Boulet and Grenier, 1978, for health and Clark et. al., 1979, for education) and others have been proposed (e.g. for tourism). How these trends may affect government budgeting has been merely touched on (Denton and Spencer, 1975b, chap. 8; Howe Research Institute, 1979, chap. 5), although again considerable work has been undertaken in selected areas (e.g. Pesando and Rea, 1975, on pensions).

The purpose of this paper is threefold. First, it presents updated and extended population projections for Ontario based on work previously published by the Ontario Economic Council (Foot, 1977b). Second, it examines what these projections mean for labour force growth in the province. Finally, it investigates some of the other economic implications of the population outlook and their possible effects on public policy formulation and planning in Ontario over the remainder of this century.

The paper is arranged as follows. The second section presents in detail a population projection for Ontario to the year 2001. The projection uses 1976 Census data and is based on a 'no appreciable change' scenario. The results are summarized

5 Not surprisingly, the annual models often used for medium-term analysis make greater use of demographic information. See, for example, McCracken (1973) and Institute for Policy Analysis (1978).

graphically wherever possible. Section 3 examines the sensitivity of the projections to the chosen assumptions, thus establishing a range of feasible alternative population projections. Section 4 outlines how labour force growth in the province will likely be affected. In section 5 some of the important possible economic effects on the public sector are outlined, including changes in specific expenditure items, and consequently in the allocation of public expenditures, together with the possible effects on revenues and intergovernmental transfers. A summary and conclusions are presented in a final section.

2 A POPULATION PROJECTION TO THE YEAR 2001

The structure of population projection models is relatively well established (e.g. Statistics Canada, 1975) and their properties have been the subject of considerable investigation (e.g. Keyfitz, 1968; Sauvy, 1970). The model used in this paper follows in this tradition (see Cohen, 1976). In essence, all these models recognize that the population is a stock which can be updated by adding the new entrants (births and immigrants) and subtracting the departures (deaths and emigrants). Since the difference, or net change to the stock, is relatively small on an annual basis, the size and composition of the population in any year is largely determined by the size and composition in the previous year. Consequently, by starting with a known population size and composition and making assumptions about fertility rates, immigration and emigration rates (or levels), and mortality rates it is possible to project the size and composition of the population into the future. That is the methodology employed in this paper.

Before the assumptions underlying these models are outlined, two features of the models deserve brief mention. First, in most applications no instantaneous (or simultaneous) feedbacks are permitted in the updating process. Thus, for example, the fertility rate is assumed to be determined by

factors observed earlier than the year in question and not to be influenced by the size of the current labour force (and hence the unemployment rate).[6] This assumption is made primarily for operational convenience since in theory a population projection model is nothing but a series of identity relationships (one for each age-sex group) that could be incorporated into a simultaneous macroeconomic model in the traditional manner.

The second noteworthy feature of a population projection model concerns the distinction between projections and predictions. A projection is the numerical consequence of the assumptions chosen (Keyfitz, 1972). The bridge between a projection and a prediction is the validity of the assumptions. Since it is seldom possible to ensure the validity of assumptions about future events, the bridging problem is usually addressed in two ways, summarized in the following two questions:

- Are the chosen assumptions consistent with previously observed behaviour?
- Are the conclusions insensitive to the choice of assumptions?

If both questions are answered affirmatively, the bridging problem is of less importance in the formulation of policy than if either is answered negatively. A negative response implies a need for a 'flexible' approach to policy development since there is then a better chance the future will deviate from the projection. Both techniques of assessing the validity of assumptions are employed in this paper.

Assumptions

Since the details of the model used in this paper have been outlined elsewhere (Cohen, 1976; Foot, 1977b), only a cursory

6 Modern microeconomics argues that the fertility and participation decisions are simultaneously determined as part of the theory of the allocation of time. See, for example, Willis (1973) for the United States and Carliner et. al. (1978) for Canada.

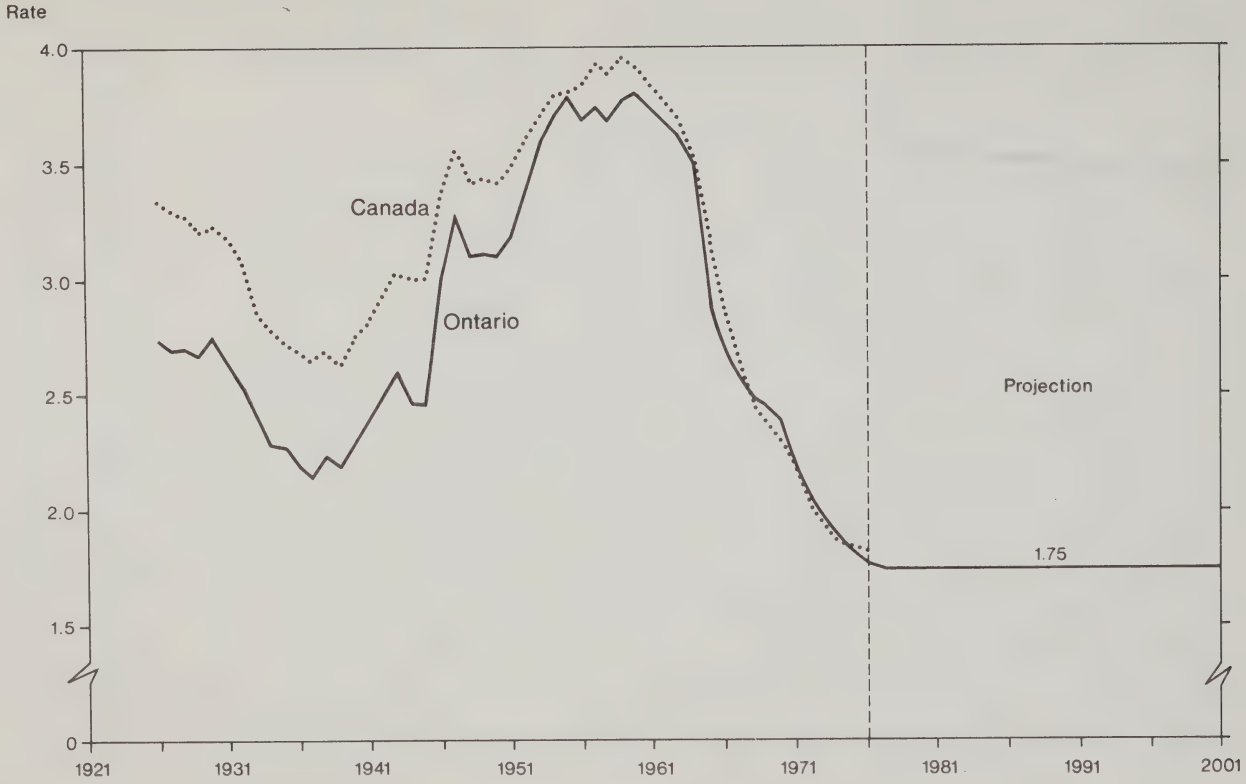
review will be presented here. As noted above, most population projection models require a specification of the population composition at some initial period and the components of population change. The most recent (1976) census of Ontario (outlined later) is used here to give the initial population size and composition. The number of births is calculated from an exogenously supplied fertility rate (discussed below) and an endogenously determined age distribution of fertility incorporating projected slight declines in the modal age of fertility, the most common child-bearing age. The number of deaths is calculated by multiplying the number of persons in each age-sex group by the relevant survival rates, which are incorporated into the model and are assumed to be gradually increasing. The difference between those persons entering the province and those leaving is termed net migration, which includes both international and interprovincial components. Total net migration is specified exogenously and allocated to the various age-sex groups by an estimated distribution. Consequently, this model requires that an aggregate fertility rate and the level of net migration to the province be specified as exogenous inputs.[7] These assumptions are drawn from the province's historical experience.

Figure 1 presents the period total fertility rate for Ontario (and Canada) since 1926. As a simple sum of age-specific fertility rates at one time, it makes available an approximate measurement of the average number of children a woman would have in her lifetime. It is assumed that a change in the total fertility rate will be spread over all female age groups.[8] Figure 1 shows, first, that the Ontario rate has usually been below the national average, although the gap has

7 In developing the projections the model was 'fine-tuned' to incorporate actual data for 1976-7 and 1977-8 where available.

8 Two technical points may be mentioned here. First, in the projection period the average and modal ages of the fertility distribution decline slightly in accordance with observed average trends (Statistics Canada, 1975). Second, this is a female-dominant model

Figure 1: Period total fertility rate, Canada and Ontario



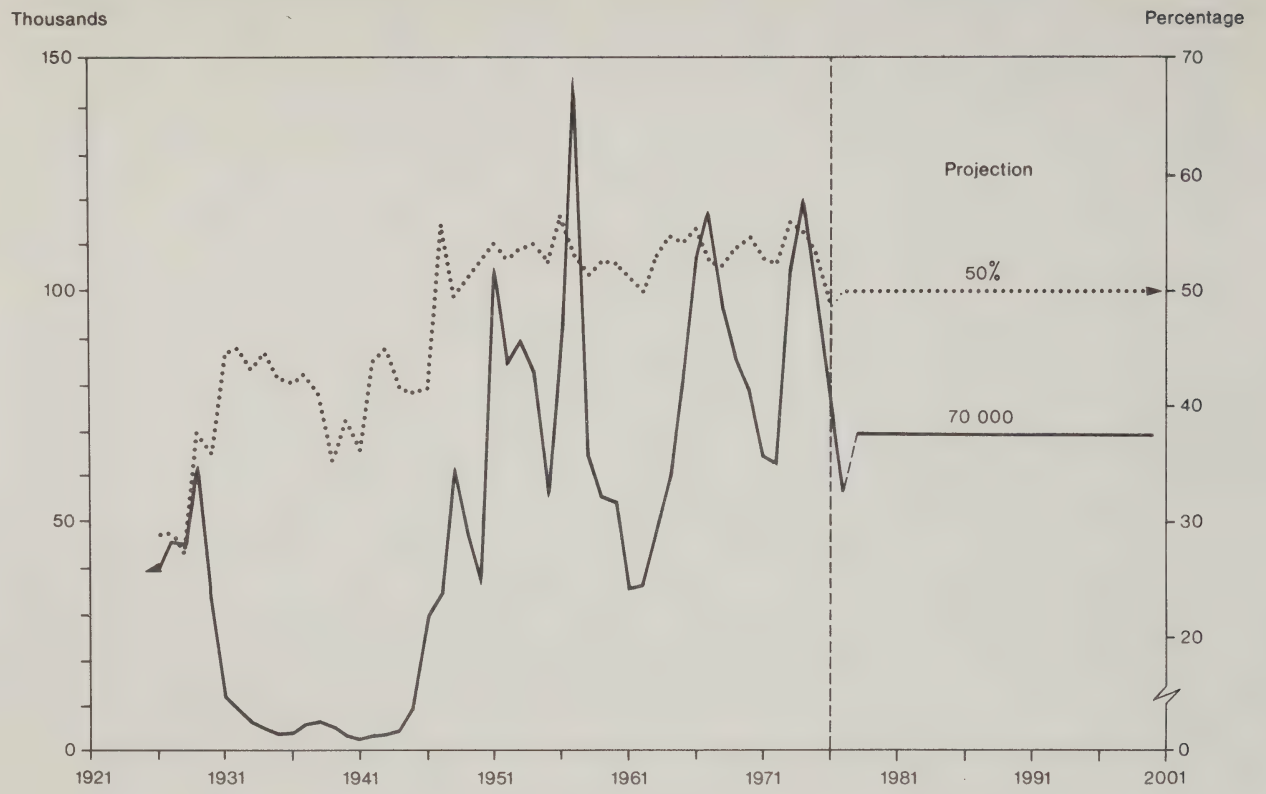
narrowed since the second world war. Second, a drop in the fertility rate following the onslaught of the depression is quite apparent, although it is dwarfed by the subsequent rise in the fifties and then the dramatic decline of the sixties and seventies. Third, the current rate is around 1.76 (births per woman), which is below the estimated replacement level of 2.12. This means that, provided there were an equal number of women in each age group and zero net migration, the population would be declining (that is, not replacing itself). In Ontario, because of the current non-cylindrical nature of the population structure (shown in Figure 4) this is in fact not the case, and there are approximately twice as many births as deaths (Table 1). There is much debate over whether or not this downward trend will continue. The current European experiences suggest a continued decline (e.g. Ontario, 1978a), but ingenious arguments have also been advanced for a turnaround (e.g. Easterlin, 1978). In light of these disagreements and the aim of developing a projection assuming no appreciable change, a birth rate of 1.75 was chosen for the entire projection period. The sensitivity of the projection to changes in this rate is examined in the next section.

Immigration to Ontario from overseas is summarized in Figure 2 (solid line, left axis). Relatively high immigration prior to the depression was replaced by annual levels of less than 10 000 persons during the war. After the war immigration returned to the levels of twenty years before. The fifties brought a new era, and since 1951 immigration to Ontario has averaged around 80 000 persons a year. Over the same period Canada's annual intake has averaged slightly more than 150 000 persons, so that Ontario's share has been around 53 per cent.[9]

(Keyfitz, 1972, 349) in that the age distribution of mothers at the birth of children suffices to project both sexes and the ages of fathers are not required.

9 For more detailed information see Foot (1977b, 104).

Figure 2: Immigration to Ontario



The upward trend in this share in the forties (Figure 2, broken line, right axis) probably reflects the gradual population movement to the more urbanized centres.

These immigration flows have been quite volatile, in some cases reflecting international 'emergencies.' It would be as mistaken to suggest that such events will not be part of the next twenty-five years as to try to predict them. Consequently, an average level of immigration is assumed for each year in the projection period. The resulting projection must therefore be interpreted as a trend around which actual deviations are very likely to occur. In the past three years (1976-8) more than 68 000 persons entering Canada have settled in Ontario annually (Table 1). This reduction probably results from a revised national immigration policy as well as below-trend economic conditions. Without entering the debate about the relative weight of these factors, a number of 70 000 persons a year has been chosen for the 'no appreciable change' projection. If half of Canadian immigrants come to Ontario, this would imply an annual national immigration level of around 140 000 persons.

It is not easy for Canadian statistical authorities to estimate the level of emigration and interprovincial migration. They are combined in Table 1, which shows an increasing net loss from these sources. From 1976 to 1978 this loss averaged slightly more than 40 000 persons, and as was done with immigration, this is the annual figure chosen for the projection period. The net difference (70 000 minus 40 000) of 30 000 persons is then distributed over the various age-sex usually been below the national average, although the gap has groups in the proportions embodied in the model.[10] Again, the sensitivity of the projection to this assumption is examined in the next section.

10 Alternative assumptions can lead to the same net figure. For example, an annual intake of 60 000 persons and a net loss of 30 000 persons would produce the same figure. The estimated age-sex distribution of these persons is an average and assumed not to be size- or composition-specific.

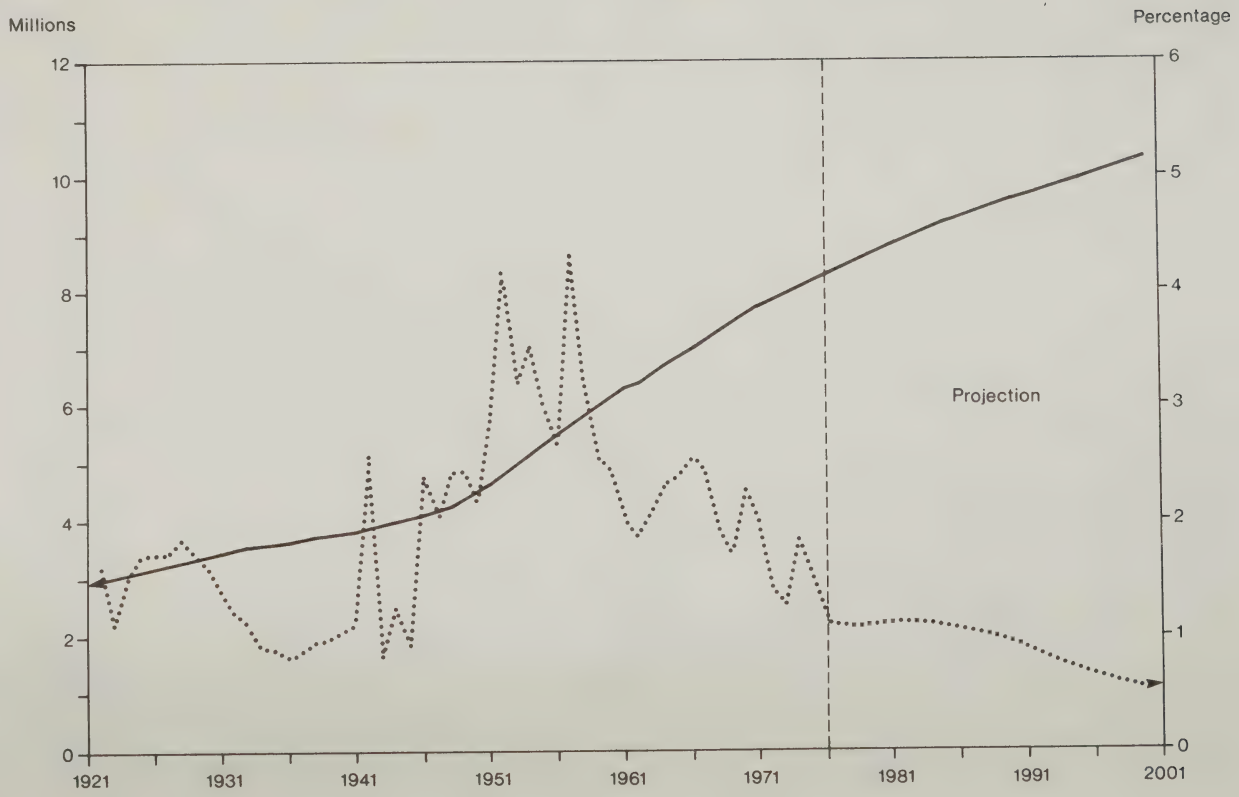
TABLE 1: Components of population growth, Ontario (annual averages, thousands)

Period	Growth	Births	Deaths	Immigration	Net migration and emigration
1951-5	3.3	125.5	44.5	82.2	-4.1
1956-60	3.0	150.4	48.7	83.2	-15.9
1961-5	2.1	154.7	52.3	49.9	-16.8
1966-70	2.2	131.0	55.1	97.5	-20.7
1971-5	1.6	126.9	58.9	87.9	-31.7
1976-8	1.1	124.5	61.1	68.1	-40.9

Projection

Figure 3 summarizes the population (solid line, left axis) and its annual growth (broken line, right axis) in the province since 1921. Over the fifty years prior to 1976 the population grew from approximately three million persons to over eight million. Over the next twenty-five years an additional two million persons are projected to be added, to reach a population of 10.3 million persons by the turn of the century. The most rapid period of growth was clearly the 1950s, with an annual average of more than 3 per cent (see also Table 1). The annual average growth of the decade on either side (i.e. the 1940s and 1960s) was around 2 per cent, and it is interesting that the projected annual average of the 1970s and early 1980s will not be unlike that of the late 1920s and 1930s (i.e. around 1 per cent), although the pattern is clearly different. Thereafter the similarity is likely to end, with population growth through the remainder of the century projected to diminish gradually to around one-half of 1 per cent a year. This decline which does not really get established until the mid-1980s, is explained by the changing age-sex composition projected for the population.

Figure 3: Population of Ontario



The actual age-sex composition for Ontario, by five-year age groups, obtained from the 1976 Census is presented in Figure 4. The most populous five-year age groups are the teenagers, with about 400 000 in each of the four teenage groups.[11] This structure reflects in large part the births that took place around the peak in the fertility rate (Figure 1). Figure 4 in addition shows that the population 'pyramid' of the early and mid-1960s[12] has been replaced by what has sometimes been referred to as a 'pregnant cylinder' - the base of the 'pyramid' having narrowed considerably. The consequent impact on primary school enrolment has become an issue of considerable concern for policy-makers in the 1970s. Also, all the five-year age groups are now outnumbered by females aged 65 and over, comprising almost 430 000 females, compared to 310 000 males.

Projecting the population forward five years (to 1981) raises each bar in Figure 4 one age group and results in the composition portrayed in Figure 5. In spite of the (assumed) contribution of low fertility levels, the movement of the most populous five-year age group into their early twenties, when traditionally the average probability of child-bearing rises, leads to an increase in the number of births and an expansion in the bottom bar. Since this phenomenon will likely continue well into the 1980s as the teenagers of the mid-1970s become the young (child-bearing) adults of the 1980s, the decline in population growth can be expected to stop until this group has passed through the traditional child-bearing years. That is why a further decline in population growth is unlikely to become apparent until around the mid-1980s (Figure 3). Furthermore, the number of persons aged 65 and over in Figure 5 will continue to grow.

11 The exact figures (in thousands), which can be read off Figure 4, are males 10 to 14 years, 409.3; males 15 to 19 years, 412.7; females 10 to 14 years, 389.5; and females 15 to 19 years, 395.3. Furthermore, the number of persons aged 65 and over in Figure 5 will continue to grow.

12 This can be approximated by covering over the bottom two or three bars in Figure 4.

Figure 4: Age-sex composition of Ontario, 1976

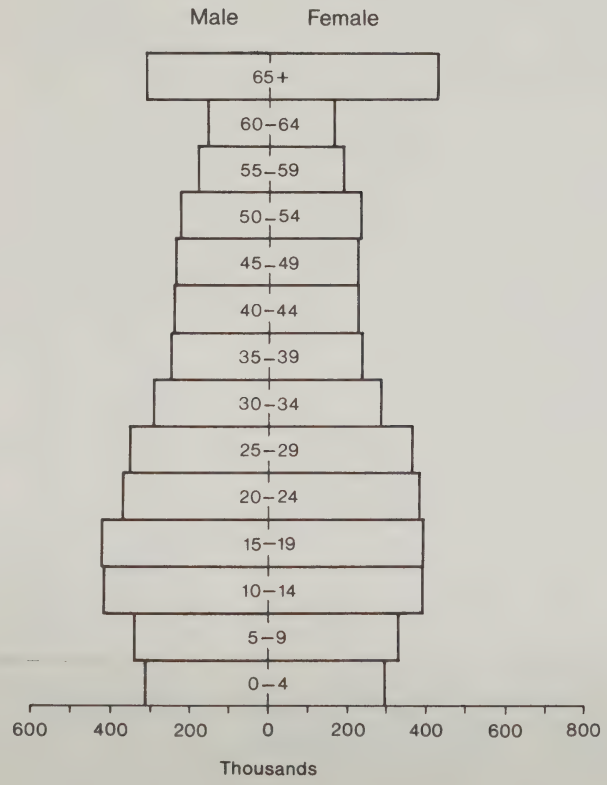
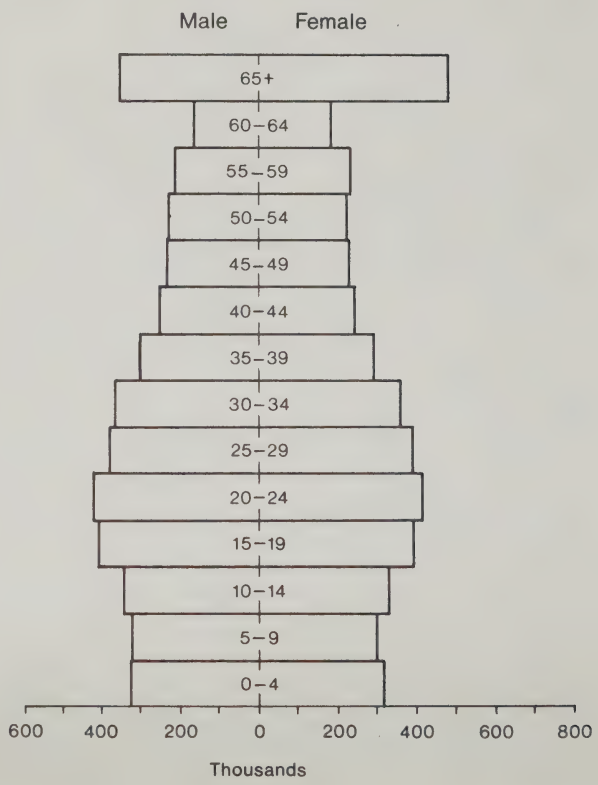


Figure 5: Age-sex composition of Ontario, 1981



Figures 6 and 7 show the demographic implications of continued projection to 1991 and 2001 respectively. By 1991 the most populous five-year age groups will contain those aged 25 to 34 and the somewhat smaller group of those who in 1976 were aged 5 to 9 will have entered the traditional child-bearing years. Consequently the bottom bar begins to narrow again. By this time the number of persons aged 65 and over will exceed one million, with about 60 per cent of them female. These trends continue to the end of the century, with the bottom bar displaying ever smaller five-year age groups and the size of the 65 years and over group (especially the females) getting much larger. By the year 2001 the population is projected to total 10.288 million persons of which 12.3 per cent are aged 65 and over, compared to 8.9 per cent in 1976.

Recent attention has focused on the increasing proportion of the population in the senior age groups, largely as a question of the future viability of existing pension arrangements (e.g. Calvert, 1977) and the impact of existing pension schemes on macroeconomic performance (e.g. Feldstein, 1974). These issues are surveyed in the fifth section. The demographic evidence underlying these issues is presented in Figure 8. First, consider the bottom (broken) line (right axis), which expresses the group of persons aged 65 and over as a percentage of the total population. This percentage will more than double over the eighty-year period covered in Figure 8 (1921 to 2001), rising from 5.8 per cent in 1921 to a projected level of 12.3 per cent in 2001. Because of the 'baby boom' of the 1950s and early 1960s (Table 1), this percentage was relatively constant at a little over 8 per cent in these years.[13] After 1971, however, the updward drift in this ratio once again became evident and it is projected to continue through the remainder of this century; this fact is the demographic basis for the concern over issues related to pensions.

13 It was the same level in 1971 as it was in 1956, namely 8.4 per cent.

Figure 6: Age-sex composition of Ontario, 1991

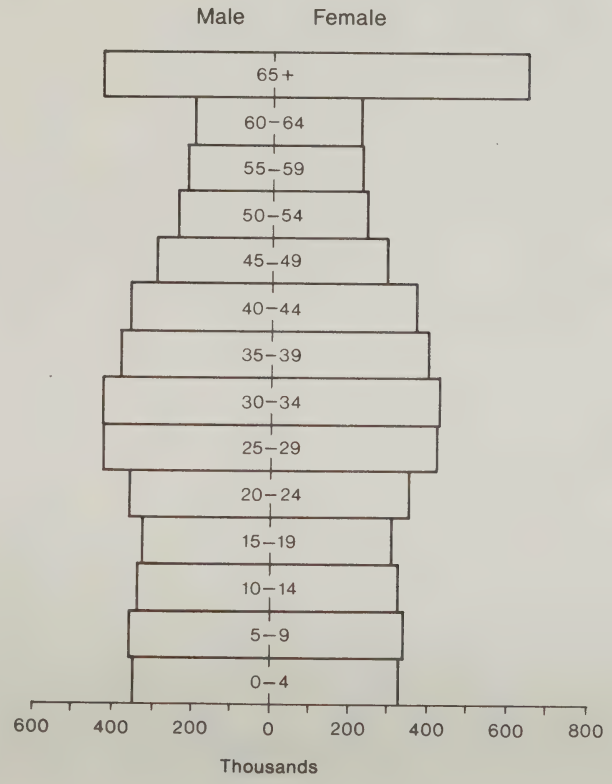
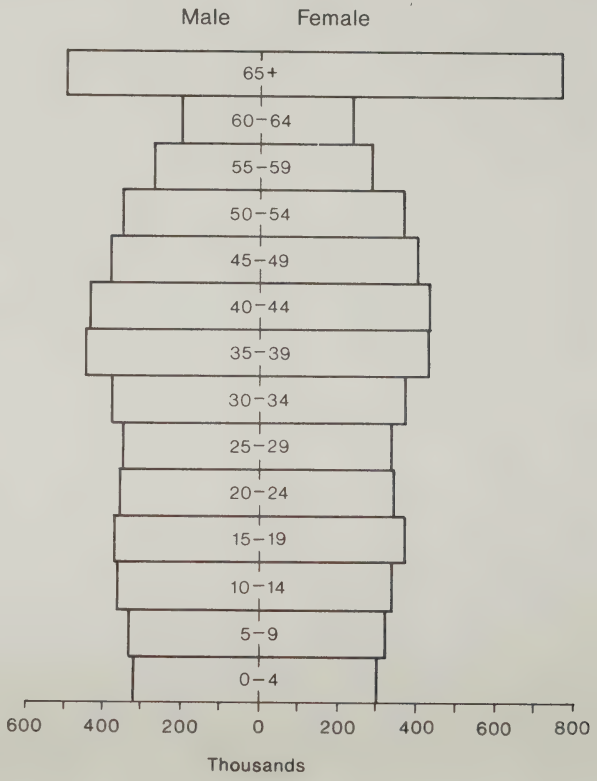


Figure 7: Age-sex composition of Ontario, 2001



The senior age group is of course not the only age group with 'dependency' status in our society. The pre-working age group (zero to 14) also fits this classification[14]. The top (solid) line (left axis) in Figure 8 measures numerical dependency by expressing the working-age population aged 15 to 64) as a ratio to the 'dependent' population (aged zero to 14 and 65 and over).[15] In 1921 there were 1.8 persons of working age for every non-working age person in the population; this figure rose to 2.1 in 1941 and then declined to 1.5 in 1961. Since then it has been rising, to reach 1.9 by 1976. The projections show a continuing increase to a peak of 2.2 in 1986 and the maintenance of a level between 2.1 and 2.2 throughout the remainder of the century.

This result is a consequence of two opposing developments: a rapid rise, to the highest level yet seen, in the ratio of persons over 64 to the total population, and an even more rapid decline, to the lowest figure ever experienced, in the corresponding ratio for those under 15 years of age. Hence in the 1980s and 1990s the ratio of the population of working age to the 'dependent' population will be higher than at any time in this century. These are the major demographic features against which public policy must be developed in Ontario.

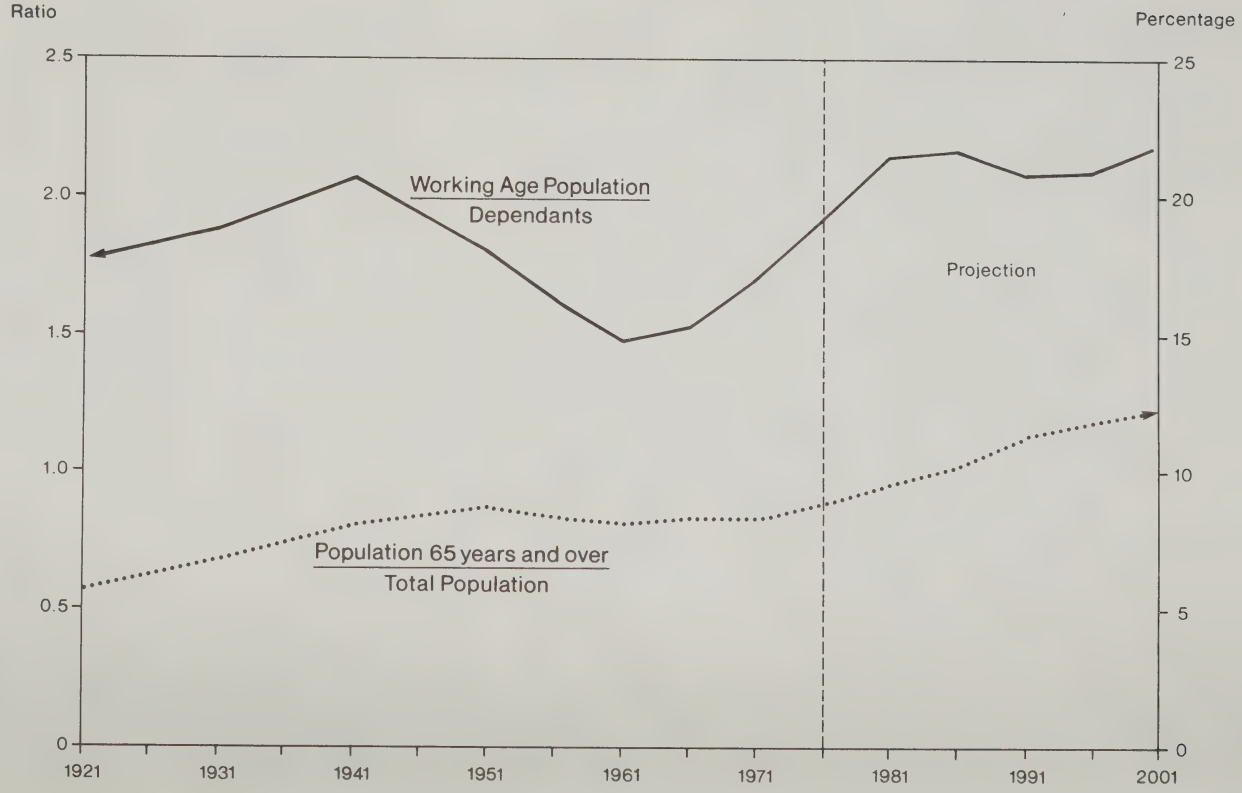
3 ALTERNATIVE POPULATION PROJECTIONS

The projections set forth in the last section were based upon specific assumptions about period total fertility and net immigration from 1978 to the year 2001. While some guidance can be obtained from recent developments and consideration of the forces that helped shape them, obviously the actual course of fertility and net immigration over the next two decades

14 The choice of terminating age (14 years) for this group is somewhat arbitrary since approximately one-half of the 15 to 19 year olds do not participate in the labour force (see section 4) and consequently could be defined as 'dependants.' However, the conclusions are essentially the same if 'dependants' include all those up to the age of 19.

15 This is not the same as expenditure dependency, which is discussed in section 5.

Figure 8: Numerical dependency ratios, Ontario



cannot be known with any certainty. It follows that the standard projections must be examined to determine how sensitive they are to change in these basic assumptions. In this section the calculations are repeated using a range of alternative assumptions.

Figure 9 sets out a number of period total fertility rate assumptions ranging from one with a continued decline in that variable to 1.50 by the turn of the century, through several intermediate alternatives, to another with an immediate reversal of recent trends which rises to 2.20 by the same date. In addition, a number of alternative assumptions about net immigration were considered, ranging from zero to 60 000 persons a year. To avoid the plethora of possible combinations, the results for the various fertility alternatives were computed on the assumption that the net immigration assumption would remain at 30 000 and those for the various net immigration alternatives assuming that period total fertility would be 1.75. Figure 10 displays the range of resulting population projections, while Table 2 summarizes some of the details of these alternative projections for the year 2001.

The results show the total population of the province at the turn of the century ranging from 9.5 million persons (with zero net immigration) to 11.1 million persons (with 60 000 net immigration). Basically, for every additional net average annual intake of 10 000 persons over the projected period the terminal (2001) population increases by 277 000 persons. This includes the 250 000 persons generated by the intake (which covers the reuniting of families, etc.) and those born to the families of these new immigrants after their arrival in Ontario. Alternative fertility rate assumptions result in terminal populations within this range (Table 2). A change of 0.10 in the period total fertility rate throughout the projection period would bring a change (in the same direction) of 117 000 persons in the population of the year 2001, representing the accumulated number of additional births over the projection period.[16]

16 Since these effects are additive it is possible to generate even more extreme projections than those contained in Table 2.

Figure 9: Alternative fertility projections, Ontario

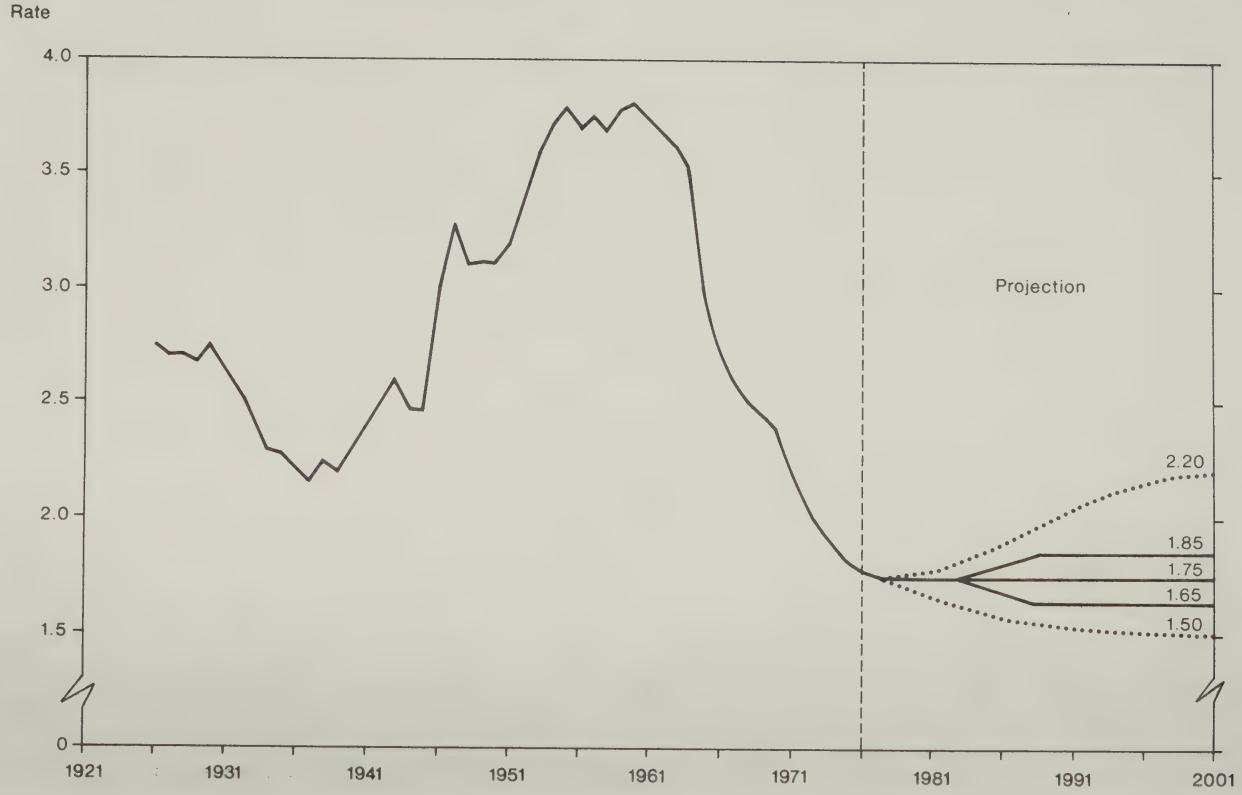


Figure 10: Alternative population projections, Ontario

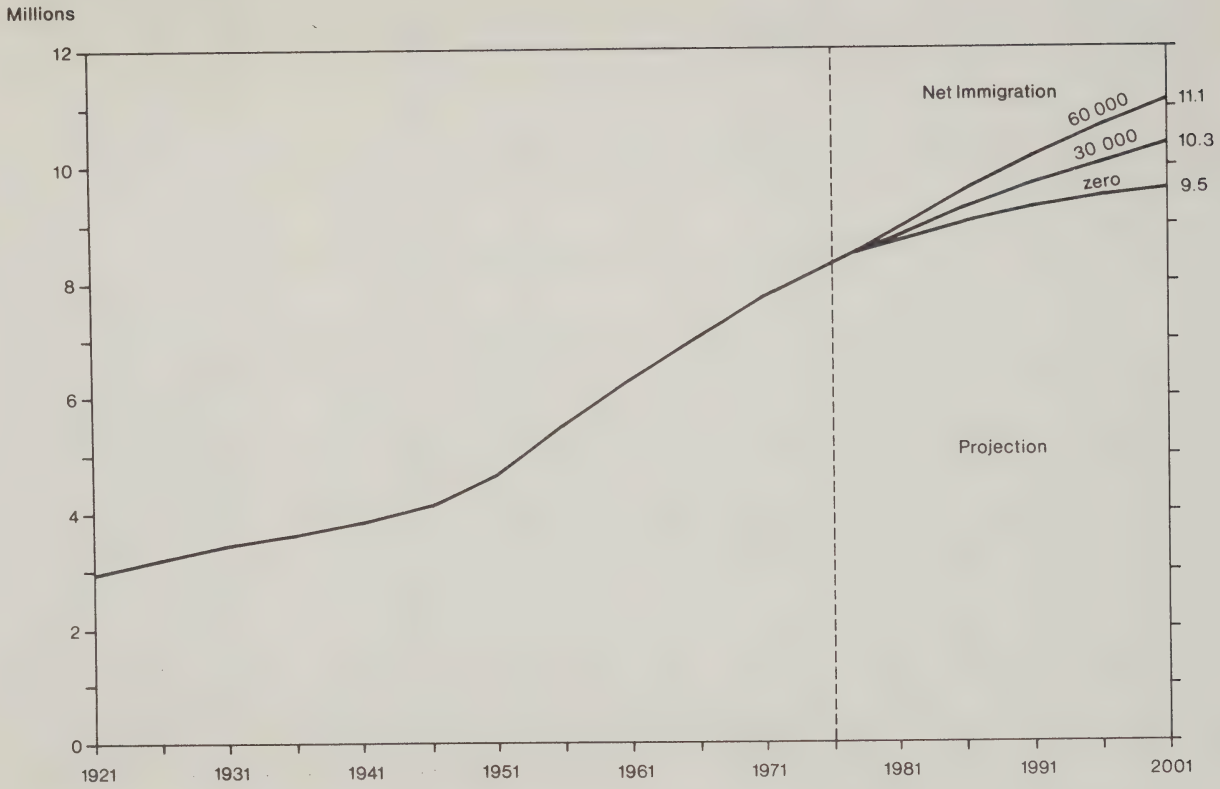


TABLE 2: Alternative population projections, Ontario, 2001

Alternatives	Size (thousands)	Male (%)	0 to 14 years (%)	15 to 64 years (%)	65 years and over (%)	W.A.P.* DEP
1976						
Actual	8 265	49.6	25.1	66.0	8.9	1.94
P.T.F. = 1.75:						
Net immigration/year						
zero	9 457	48.9	18.6	68.4	13.0	2.16
10 000	9 734	48.8	18.8	68.5	12.8	2.17
20 000	10 011	48.8	18.9	68.6	12.5	2.18
30 000**	10 288	48.8	19.0	68.7	12.3	2.19
40 000	10 565	48.8	19.1	68.8	12.1	2.20
50 000	10 842	48.8	19.2	68.9	11.9	2.21
60 000	11 119	48.7	19.3	69.0	11.7	2.22
Net immigration = 30 000:						
Terminal P.T.F.						
1.50	9 982	48.7	17.1	70.2	12.7	2.36
1.65	10 171	48.8	18.2	69.4	12.4	2.26
1.75**	10 288	48.8	19.0	68.7	12.3	2.19
1.85	10 404	48.8	19.8	68.0	12.2	2.13
2.20	10 671	48.9	21.7	66.4	11.9	1.98

* W.A.P. = Working age population (15 to 64 years); DEP = Dependants (0 to 14 years and 65 years and over)

** Projection outlined in section 2.

The projection is relatively insensitive to the choice of assumptions. The male percentage of the population is projected to decline from the existing level in all projections. The distribution of the population over the various age groups is slightly more sensitive to the choice of assumptions, although all alternatives are unambiguous about the direction of the change from existing levels. For example, the percentage of the population aged 65 and over, which was 8.9 per cent in

1976, is projected to increase to between 11.7 and 13.0 per cent by 2001, with the higher percentages experienced in the lower-growth scenarios. Similarly, the numerical dependency ratio remains around 2.2 regardless of the level of net immigration but not surprisingly is somewhat more sensitive to the choice of fertility assumptions. However projected levels still remain close to or above historical maximums (see Figure 8).

In summary, the apparent clarity of the projected trends and the relative insensitivity of many of them to the choice of assumptions may be of some assurance to those responsible for the development of public policy. However, the projections for total population and the implied annual average growth rate are sensitive to the choice of assumptions, and the uncertainty this should engender must be borne in mind in the development of public policy.

4 LABOUR FORCE PROJECTIONS TO THE YEAR 2001

The translation of a population projection into a labour force projection (by age and sex) for the province of Ontario requires two additional assumptions. First, the population of each age-sex group must be adjusted by removing inmates of institutions and Indians on Reserves to arrive at the traditionally defined labour force source population. Secondly, labour force participation rates must be applied to each source population and aggregated to obtain a projected labour force for the province. Each of these assumptions is briefly discussed below.

Table 3 presents the 1976 Census population estimates and the labour force source population estimates for selected age groups for each sex. The ratio of the latter to the former is the estimated (multiplicative) adjustment factor applied to the population projections outlined above to arrive at labour force source population projections. This ratio provides an estimate of the number of people in the population who have been tradi-

TABLE 3: Labour force population ratios, Ontario, 1976

Age category (years)	Population (1 June, thousands) (1)	Labour force source population (annual average, thousands) (2)	Ratio (2/1)
Males			
15-19	412.665	407	0.9863
20-24	368.270	362	0.9830
25-44	1 140.065	1120	0.9824
45-64	802.570	793	0.9881
65+			
Females			
15-19	395.325	392	0.9916
20-24	376.095	374	0.9944
25-44	1 126.750	1123	0.9967
45-64	830.010	825	0.9940
65+	428.615	393	0.9169
Total 15+	6 190.680	6084	0.9828

tionally defined as not entering the labour force.[17] On average, 1.7 per cent of the population is excluded for this reason. These age-sex-specific ratios presented in Table 3 are assumed constant throughout the projection.

Recent experience in labour force participation by the same age-sex groups is presented in Table 4. In the past twenty years the labour force participation rate of the 15 to 19 year olds has followed a symmetric U-shaped curve, while that of the 20 to 24 year age group has followed an asymmetric U-shaped curve, with the male rate only recently turning up whereas the female rate turned up in the early 1960s. All male rates for age groups above 25 have displayed downward trends, as has the 65 and over female group, whereas females aged 25 to 64 have displayed strong upward trends.

17 It also takes account of the slightly different observation dates; population is measured at 1 June, while the labour force source population is an annual average.

TABLE 4: Participation rates, Ontario (percentages)

Age category (years)	Actual 1976	Actual 1977	Actual 1978	Projected* 1986
Males				
15-19	53.1	55.0	58.3	62.9
20-24	84.3	85.9	86.2	87.8
25-44	96.8	96.6	97.1	95.0
45-64	88.6	88.2	88.5	86.1
65+	17.9	17.0	17.0	20.9
Females				
15-19	51.0	50.8	52.9	58.4
20-24	69.9	71.8	72.4	73.8
25-44	58.9	60.3	63.6	65.1
45-64	46.3	47.0	47.7	47.8
65+	4.8	4.3	4.5	4.8
Total 15+	63.9	64.3	65.5	66.6

* Foot (1977b, 118)

The choice of appropriate rates for the projection period is a difficult exercise. In previous work over a shorter period (Foot, 1977b) these rates were generated endogenously within a macroeconomic model. No appropriate model with a twenty-five-year horizon is available, and yet some assumption must be made. In line with the strategy of assuming no appreciable change in developing the projection presented in the second section, the 1976 rates were assumed throughout the projection period.

Since most age-sex groups registered increases in rates between 1976 and 1978 and will likely continue to do so, the resulting labour force projection can be considered to be on the low side of the range of possible alternatives, which will be presented later.

Figure 11 shows the labour force in Ontario (solid line,

left axis) and its growth (broken line, right axis) for the period for which data are available. From around two million persons in the early 1950s the labour force in the province has grown to four million persons currently and, based on the population projection presented in Section 2, is projected to reach a level of 5.1 million persons by the turn of the century under these assumptions. This number represents the addition of over one million new entrants, largely in the early 1980s as today's teenagers enter the labour force. Annual labour force growth under these assumptions remains well above 1 per cent until the mid-1980s, which is well above the population growth over the same period (Figure 3). Consequently, a general labour shortage does not seem at all likely to result from demographic developments; labour force growth will fall, but not as quickly as population growth.

The projected assumption of constant participation rates reflects the demographic impact of today's teenagers entering the labour force and gradually moving into age groups with higher labour force participation rates. By the end of the century, annual labour force growth is around 0.7 per cent, while annual population growth is around 0.5 per cent in this projection.

The distribution of the labour force by age and sex projected for selected years is presented in Table 5. The trend towards relatively fewer young people in the labour force is clear from these figures, as is the slightly higher contribution of the elderly. The slight decrease in the proportion of women in the labour force is explicable by the fact that male participation rates are higher than female rates, so that any increase in source populations brings more male entrants than female entrants into the labour force under an assumption of constant participation rates.

Since these projections are likely to be low and unrealized as a result of further increases in participation rates for females and possibly also for the young, two alternative projections were examined. The first imposed the 1978 participation rates throughout the projection period,

Figure 11: Labour force, Ontario

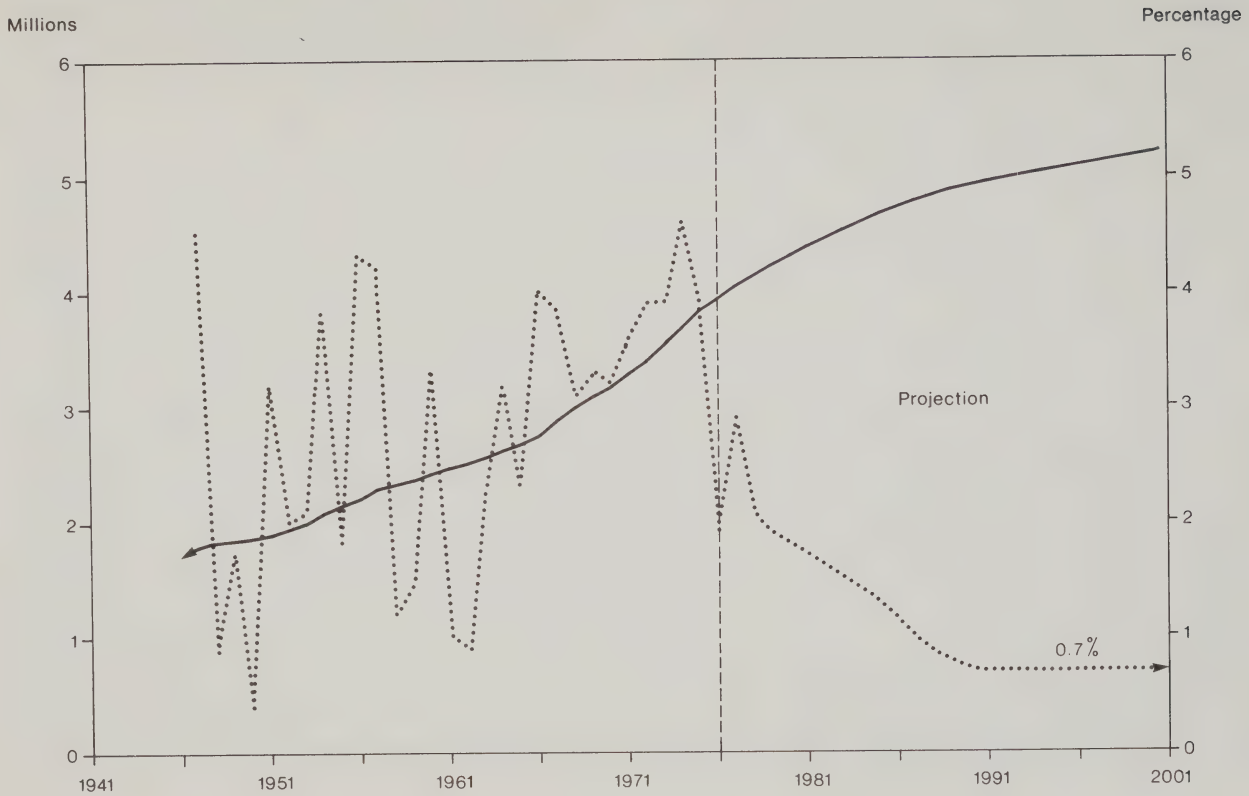


TABLE 5: Labour force, actual and projected age-sex distribution, Ontario (percentages)

Age Category (years)	1976	1981	1991	2001
Males				
15-19	5.5	5.1	3.6	3.8
20-24	7.9	8.1	6.2	5.6
25-44	27.9	28.7	32.1	29.2
45-64	18.1	16.6	18.0	21.3
65 +	1.4	1.4	1.6	1.8
Total males	60.8	60.9	61.5	61.7
Females				
15-19	5.1	4.7	3.3	3.5
20-24	6.7	6.6	5.0	4.6
25-44	17.0	17.8	19.7	17.5
45-64	9.8	9.6	9.8	12.0
65 +	0.5	0.5	0.6	0.7
Total females	39.2	39.1	38.5	38.3

NOTE: Totals may not sum because of rounding.

while the second alternative imposed the participation rates projected for 1986 in Foot (1977b, 118) throughout the projection period. The results show that the labour force would reach 5.233 million persons by 2001 under the first alternative and 5.262 million persons under the second. These are 2.5 and 3.1 per cent above the levels in the previous projection, showing the relatively small effect of different participation rate assumptions (Table 4). The percentage of males declines slightly to 60.5 and 59.8 per cent, while the percentage of young persons (15 to 24) drops from a 1976 actual of 25.3 per cent to 17.8 and 18.6 per cent. Also notable is the increasing contribution of those aged 65 and over - up from a 1976 actual of 1.9 per cent to 2.1 and 2.5 per cent.[18] In

18 This latter figure could be reinterpreted to proxy the impact of a loosening in the requirements of compulsory retirement provided that it resulted in the increase in the labour force participation rate presented in Table 4.

summary, both projected labour force levels and the resulting age-sex distribution are relatively insensitive to these alternative participation rate assumptions.

The labour force implications of the alternative population projections reviewed in the previous section are summarized in Table 6. The labour force in 2001 is relatively insensitive to the choice of fertility assumption, since people born in, say, 1980 do not enter the labour force until 1995 at the earliest. On the other hand the projected labour force is sensitive to the assumption on net immigration. Every 10 000 persons a year more than projected results in an additional 146 000 persons being added to the labour force by 2001 (at 1976 participation rates), reflecting the assumption that approximately 58 per cent of immigrants find their way into the labour force of the province.

The compositional implications of the alternative projections, also summarized in Table 6, indicate almost complete insensitivity to the choice of assumptions. Individual age-sex groups display slightly greater sensitivity, but the differences in the projected composition of the labour force are relatively minor under the alternative assumptions.

There are two policy implications of these labour force projections. First, more than a million new entrants to the labour force are projected by the turn of the century, the majority appearing in the next decade. The challenge of finding gainful employment for these people will not disappear. Secondly, the aging of the provincial population at large will be reflected in its labour force. The under-25 age group, currently about one-quarter of the labour force, is projected to decline considerably. The challenge will be to find sufficient jobs needing skills and experience commensurate with the age-sex structure of the projected labour force.[19]

In summary, the apparent insensitivity of parts of the projection to the choice of assumptions will again reassure

19 The potential role of manpower training programs in creating necessary skills or retraining experienced labour force participants should not be overlooked.

TABLE 6: Alternative labour force projections, Ontario, 2001

Alternatives	Size (thousands)	Male(%)	15 to 24 years(%)	25 to 64 years(%)	65 years and over(%)
1976 Actual	3 885	60.8	25.3	72.8	1.9
P.T.F. = 1.75 Net immigration/year					
zero	4 667	61.7	17.5	80.0	2.5
10 000	4 813	61.7	17.5	80.1	2.4
20 000*	4 959	61.6	17.5	80.1	2.4
30 000*	5 105	61.6	17.5	80.2	2.3
40 000	5 251	61.5	17.5	80.2	2.3
50 000	5 397	61.5	17.5	80.3	2.2
60 000	5 543	61.5	17.5	80.3	2.2
Net immigration = 30 000 Terminal P.T.F.					
1.50	5 073	61.6	17.1	80.6	2.3
1.65*	5 098	61.5	17.4	80.3	2.3
1.75*	5 105	61.6	17.5	80.2	2.3
1.85	5 112	61.6	17.6	80.1	2.3
2.20	5 121	61.6	17.8	79.9	2.3

* Projection outlined in section 2.

NOTE: Projections assume 1976 participation rates.

policy-makers. In particular, the projected age-sex composition of the labour force in Ontario is relatively insensitive to the range of assumptions considered here. Of course the size of the labour force depends on the amount of net immigration to the province, but otherwise the labour force projections reflect the aging of the underlying provincial source population.

5 IMPLICATIONS FOR PUBLIC POLICY

The future trends in the province's population are projected to be as follows:

- an average growth rate of about 1 per cent a year through to the mid-1980s, gradually declining to about one-half of 1 per cent by the end of the century, implying the addition of approximately two million persons over current levels;

- a continually increasing percentage of persons aged 65 and over, reaching more than 12 per cent of the total by the end of the century compared to around 9 per cent in 1976;

- a continually decreasing percentage of pre-working-age persons (zero to 14) even more pronounced (from more than 25 per cent to about 19 per cent) than the increase in the senior age group; and consequently

- a higher proportion of the population of working age than experienced in the previous sixty years (unless immigration is exceedingly high and fertility very low), resulting in

- labour force growth that exceeds population growth throughout the projection.

Since these trends have already begun in the composition of the existing population, and since most are relatively insensitive to alternative assumptions, they can be projected with considerable certainty. Against this demographic background public policies for the province must be devised and implemented for the 1980s and beyond. Some of the implications for government expenditures in the province and for the provincial budget, including intergovernmental transfers, will now be examined.

Government expenditures

To see how the projected demographic changes may influence provincial government expenditures it is useful to begin with a review of three selected areas: pensions, health, and education.

Public pensions in Canada were initiated with the introduction of the Old Age Security scheme in 1952. The Canada/Quebec Pension Plan (CPP/QPP) was established in 1966. These schemes are partially funded and partially financed on a

pay-as-you-go basis by a payroll tax (called compulsory pension contributions) collected from the working population. In this case the effective pension tax rate is determined not only by the pension benefit provided but also by the number of eligible recipients compared to the number of persons employed. Consequently, it is sensitive to the demographic shifts outlined above.[20] Pesando and Rea (1977) calculated the 'pension ratio,' that is, the number of persons aged 65 and over divided by the working age population (15 to 64). This ratio will be an accurate indicator of projected rate changes if labour force participation and unemployment rates remain unchanged (since, under these conditions, the ratio of employment to working age population remains unchanged); increases in participation or employment rates will enable a reduction in the pension tax rate at a fixed level of benefits,[21] and vice versa. This ratio in Ontario is projected to rise from 0.136 in 1976 to 0.179 in 2001, suggesting an increase in pension tax rates (of 32 per cent) over the projection period if a fixed level of benefits is to be provided to the aged. Such evidence has led some observers to question the viability of existing pension arrangements (e.g. Calvert, 1977) and the consequent lack of security for the aged.

Although revealing, this comparison is somewhat unfair for two reasons.[22] First, the pension tax is a payroll tax, not a

20 A fully funded pension scheme on the other hand is not sensitive to demographic shifts since the fund's value is equal to the accrued value of pension benefits. For a further discussion of these issues see Ontario (1978b).

21 More accurately, a fixed ratio of benefits to the earnings of the employed population.

22 Note that further increases in the labour force participation rate or decreases in the unemployment rate over the projection period will also reduce the implied projected increase in effective pension tax rates. On the other hand increases in the relative level of benefit provided would lead to an even greater projected increase in the rates. Furthermore, abolition of mandatory retirement at age 65, which results in more working age persons, would reduce the implied projected increase in effective pension tax rates, whereas increased propensity for earlier retirement would have the opposite effect.

head tax. Consequently, if projected payroll (wage) growth exceeds employment growth, as might be expected if labour productivity grows, projected tax rate increases can be moderated. For example, a differential of 2 per cent a year for twenty-five years compounds to 64 per cent, or more than twice the projected increase in the pension tax rate. This suggests that labour productivity growth of a little more than 1 per cent per year reflected in wage increases would be sufficient to offset the increases in pension tax rates implied by the population projections. This result certainly appears attainable[23] The second reason why a concentration on the pension ratio can be misleading is that it ignores the resources required by the younger members (zero to 14 year olds) of the population. If because of reduced numbers this group requires relatively fewer resources, some resources can be 'released' to provide for the pensionable age group in the society. This point will be examined further below.

In summary, the impact of the projected demographic changes on unfunded and partially funded pension schemes (such as the CPP/QPP) is ambiguous. Although increasing effective pension tax rates are implied by the projected demographic data alone, these increases could be moderated or offset by increased labour force participation (at constant employment rates), decreased unemployment rates, increased retirement ages, continued productivity growth, or the release of resources from the younger age groups in the population.[24]

A related issue is the impact of demographic changes on consumption and saving in the economy. A simple life-cycle model of consumption and saving behaviour posits dissaving in

23 An interesting and related issue is whether the changing demographic composition will affect productivity performance. For a review of the existing literature see Clark et al. (1978, 927-9).

24 A final caveat since the projection terminates at 2001: from Figure 7 it is apparent that twenty-five years later (that is, 2026) the most populous age groups (today's teenagers) will be entering the pensionable years. Then this problem will likely become much more acute.

early years[25] as an average individual accumulates education, training, and household assets, followed by a period of saving as the individual accumulates assets, which can be consumed over the pensionable years when dissaving again occurs. Such a model suggests that demographic changes will have an ambivalent impact on the saving rate in the future. On one hand an upward pressure can be expected as the most populous age group moves into the traditionally high saving years of their life-cycle. On the other hand the increasing number of elderly will be entering the traditionally high dissaving years of their life-cycle. The overall impact will depend on the relative magnitudes of these countervailing forces. Denton and Spencer (1975b, chap. 5), in their exploratory study using aggregate data, find no significant impact of demographic changes on personal saving.

Whether or not this effect will also be influenced by existing pension arrangements is currently an unresolved issue. Feldstein (1974) and Munnell (1974) argue that the U.S. pension program has reduced aggregate saving, but Barro (1974) argues that no impact has occurred because of the offsetting effect of voluntary increases in savings for bequests, including increased education for the progeny. A recent study by Turner (1978) found a positive effect. For Canada, Ontario (1977b) concluded that there has been a reduction in personal saving but that the reserve accumulated by the partially funded CPP/QPP has been sufficient to offset the estimated reduction, whereas Boyle and Murray (1978) conclude that the public pension system has had no net impact on personal saving behaviour.[26] These questions remain contradictory and unresolved.

25 Dissaving in early years means borrowing against future incomes.

26 In explaining their results, Boyle and Murray note that the theoretical negative impact has probably been offset by a positive retirement effect and the presence of effective tax shelters (e.g. RRSP and RHOSP), as well as by the presence of the intergovernmental transfers noted by Barro.

Public involvement in health care in Canada commenced in Saskatchewan in 1914, but not until 1958 did all provinces in Canada have a complete program of state medical insurance for welfare recipients. In 1965 the prime minister proposed the universal application of a full program of medical services to be administered by government with benefits transferable between provinces. The federal act on health care was passed in 1966 and took effect on 1 July 1968. Ontario joined the program in 1969 and in 1972 introduced a single payment for both hospital and medical insurance, with the administration being located in the Ministry of Health (see Foot, 1977a, for further details).

Although the cost of health care has been investigated by many authors, the impact of demographic shifts on health care costs has only recently received attention. Denton and Spencer (1975a; 1975b, chap. 6) showed that the relationship between the per capital cost of health services and age can be represented by an asymmetric U-shaped curve for both males and females. This conclusion was established on the basis of 1969 Canadian data for hospital services, 1971 Ontario data for physicians' services, and the assumption that expenditure on drugs is distributed by age and sex in the same way as expenditure on physicians' services. Weighting was on the basis of Canadian expenditure data for 1969. The results show that per capita costs are relatively high for infants, drop sharply during the early years of life, and then rise at an increasing rate, and that male costs even aside from pregnancy are lower than female costs between the mid-teens and late fifties, and somewhat higher than female costs in other age groups.

Recently, the asymmetric U-shaped curve has been used to develop projections of health care costs that reflect the changing demographic composition outlined above (assuming that relative prices and consumption patterns remain unchanged). Both Boulet and Grenier (1978) for Canada and Gross (1978) for Ontario find significant increases in per capita real health care costs. For example, under a projection for Canada approximately consistent with the one for Ontario outlined in

section 2, Boulet and Grenier calculate that there will be cost increases of over 17 per cent between 1976 and 2001 can be attributable to the projected changes in the age-sex composition of the population. Compositional changes account for about 40 per cent of the 1.5 per cent annual projected increase in total real health costs, with population growth accounting for the remaining 60 per cent. The impact of compositional changes will be relatively greater on hospital services than on physician services. Boulet and Grenier also note that lower-growth scenarios result in larger real per capita increases since older people, who as we have seen represent a higher proportion of the population in these scenarios, make greater use of relatively more expensive hospital services. Gross reaches very similar conclusions for Ontario, noting that whereas 38.3 per cent of total health care costs in Ontario were attributable to the elderly in 1976, by 2001 those aged 65 and over are projected to account for 46.5 per cent. To emphasize the changing distribution Gross estimates that by the mid-1980s those aged 85 and over will be absorbing a greater proportion of the health care costs than the entire population aged zero to 19 years.[27]

Clearly the government-supported health care sector, in Canada and in Ontario, will require greater resources both as a result of population growth and as a result of population aging if the real level of services is to be maintained. Maintenance of aggregate per capital real expenditures will be insufficent to maintain the real level of services, since it will not be adequate to account for the relatively greater demands placed on the health care sector by an aging population. There will also have to be some redistribution of services within the health care sector from physician services to hospital services, and from services oriented towards the young to those oriented towards the elderly.

27 The exact figures are 9.8 and 8.6 per cent respectively. Gross's projections are based on a net immigration assumption of 45 300 persons per year and a period total fertility declining to 1.6 by 1991 and remaining at that level thereafter.

Unlike both pension and health care expenditures, the demands of the education sector implied by these population projections are likely to decrease in relative importance. The impact of a smaller demographic cohort (Figures 4 and 5) has already been experienced at elementary schools in the 1970s and is beginning to affect secondary schools. Since the most populous five-year age groups currently are the teenagers, the outlook for secondary schools can only be for decreased enrolments (Zsigmond et al., 1977; Ontario, 1978a). Post-secondary education can continue to expect little change in its source population until into the 1980s, after which a significant decrease can be expected to occur (Statistics Canada, 1979c).

The effect of these inevitable demographic trends on the educational sector does not appear to have been fully anticipated: 'the baby boom generation has caught off guard each succeeding level of the education system. School closings and teacher strife faced by school boards across the country are evidence that education authorities were no more ready for the departure of the baby-boom generation than for its arrival' (Howe, 1979, 125). Statistics Canada has recently documented this experience for Canada and developed projections to the year 2001 (Clark et al., 1979). To improve the understanding of these changes and the adjustments they entail Ontario in 1977 established the Commission on Declining School Enrolments (CODE) which submitted its final report in 1978 (CODE, 1978). Of the many background papers prepared for CODE, only a couple have been chosen for citation here.[28]

The projections of Clark et al. (1979) show that declining enrolment will bottom out in the elementary school system in the early 1980s at approximately 90 per cent of current levels and the trough will hit the secondary schools with full force about 1990, by which time their enrolment will be approximately one-quarter lower than today's student population. Roller-coaster enrolment is expected to be characteristic into the

28 . A complete list of papers is available from the Ontario Ministry of Education.

next century, and both educational authorities and public policy planners will have to learn to adjust to these fluctuations. Fortunately the adjustment periods are relatively long, and the cyclical periods, if not the magnitudes, can be anticipated with some degree of certainty. Although the trends are similar, provinces are not projected to be affected equally. In Ontario (along with Alberta and British Columbia) lower fertility rates are projected to be partially offset by net in-migration into the school system.

Detailed projections for Ontario to 2001 were outlined by Zsigmond et al. (1977) and more recently considered by CODE. For example, Ontario (1978a) projects a decline in elementary school enrolments between 1976 and 1981 of between 8 and 13 per cent. Enrolments are then projected to rise to the early-1990s, likely peaking at a level which is still below that of 1976 (Ontario, 1978a, 28, series B) before falling once again. The height of this later peak is clearly sensitive to the period total fertility rate assumption, which incorporates a decline from 1.8 in 1975 to 1.6 by 2001 into the projections; but even under alternative reasonable assumptions it is unlikely that these findings would be much affected over the next twenty-five years. At Ontario secondary schools the bottom of the trough will not be reached until the early 1990s, after which the trend will reverse. Not surprisingly, the decline in the secondary school system is likely to be more severe than in the elementary school system compared with 1976 levels. A decline of between 16 and 22 per cent appears likely. The subsequent increase in enrolments will likely peak around the turn of the century at less than 5 per cent above the trough.

At the post-secondary level the decline in enrolments will probably not become apparent until the mid-1980s. By 1986 enrolments may well be down to levels experienced a decade before, and after that substantial declines can be anticipated until the turn of the century. At constant enrolment rates, declines of about 12 per cent from 1976 levels can be expected by the turn of the century, meaning declines of more than 20 per cent from projected peak levels in the early to mid-1980s

(see, for example, Clark et al., 1979, 80). At this level of education, the enrolment decision is a more important determinant of actual enrolments than at the primary and secondary levels. However, the demographic factors still have a strong impact on the demand for post-secondary education facilities.

The effects of these enrolment projections on the need for teachers, physical facilities, and other educational expenditures should be obvious. The facilities required by the elementary and secondary systems are likely to be below current levels at least until the turn of the century, while the rate of increase in post-secondary requirements has slowed and could become negative by the mid-1980s.[29] These projections therefore imply that resources could be 'released' from this sector for use elsewhere in the economy.

From this review of pension responsibilities, health care costs, and educational requirements it can be seen that the projected population trends will have an important effect on provincial government expenditures. However, it is important to remember that all the expenditure effects reviewed above are demand-generated. In attempting to isolate the purely demographic impact on expenditures, these projections implicitly assume a continuation of existing per capita costs. This assumption has two main consequences. Any economies or diseconomies of scale in the provision of services are ignored, as are any supply responses to the projected changes. For example, Dawson (1978) has noted that economies of scale may exist in the provision of school services, although the Ontario system is already large enough that they may be negligible. If they exist reduced enrolments might increase the per pupil costs at each level of the school system. Moreover, CODE (1978) and Clark et al. (1979) urge school system planners to take advantage of declining enrolment to rethink the objectives of education. The result could be the introduction of new programs

29 This message was clearly delivered to the Ontario Commission (Foot, 1978).

without the corresponding elimination of existing ones. Furthermore, just as physicians are far from passive to changes in demands on the health care system (e.g. Wolfson, Tuohy and Shah, 1978), so the supply response cannot be ignored in the formulation of future public policy in the province. However, they lie beyond the scope of this paper.

An assessment of these demographically induced changes on the level and mix of total government expenditures requires an integrated model which incorporates not only the disaggregated demographic information, but also the relative costs of various public services to the different age-sex groups in the population. One of the first attempts to use a disaggregated economic-demographic model to assess the impact of demographic change in the context of alternative public policies was that of Barlow and Davies (1974). They assigned parameter values which were typical of low-income economies and, using thirty-year simulations, examined the effect of alternative policies (such as malaria eradication, birth control, and disarmament) on resource transfers and the growth of per capita income. Unfortunately their macroeconomic model did not include a government sector, so that no impact on the government budget was presented. However, their model demonstrates the interrelationship between expenditures on education and health and explicitly attempts to incorporate the effects of demographic change into an assessment of alternative public policies.

In a similar exploratory study Denton and Spencer (1975b, chap. 8) simulate the effects of demographic changes on a government budget which includes expenditures on health care and education, which depend on demography and on general government services, which is assumed to depend on aggregate income. The chosen parameters are based on Canadian data. Their simulations show, not surprisingly, that as its population ages a government must devote more money to health and less to education. Whether or not the proportions are fully offsetting depends on the initial distribution of expenditures and their per capita magnitudes. The simulation results reported show a reduction of about 5 per cent in per capita

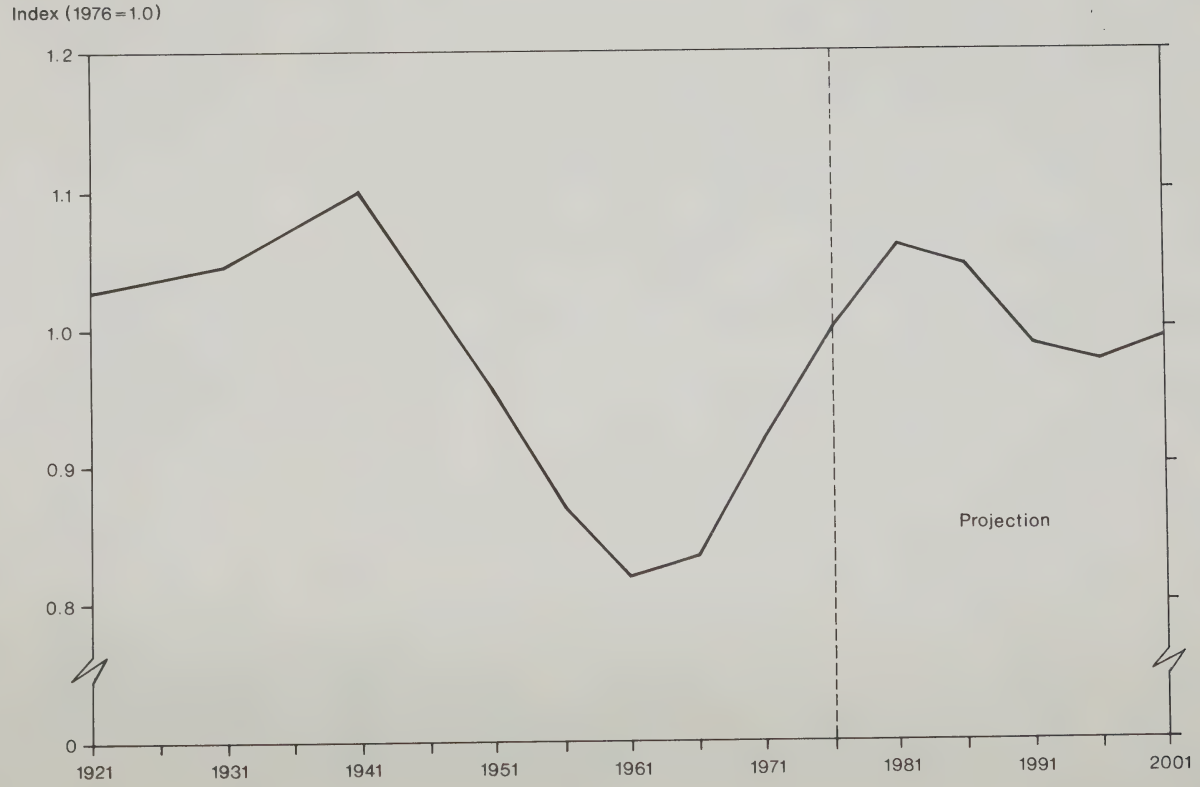
government expenditures after twenty-five years, that is, the per capita decline in education expenditure more than offsets the increase in health expenditure in Denton and Spencer's model.

In aggregating the projected impact of different public expenditure programs on total government expenditures in the province, the relative costs of supporting different age groups in the population become apparent. At current levels, for instance, the per person cost of servicing the elderly is much higher than that of servicing the young; it has been estimated that per person government expenditures are three times as great for older dependants as for youths in the United States (see Clark et al., 1978, 922) and 2½ times as great in Canada (see Ontario, 1978b, 12). Under these conditions the numerical dependency ratios presented in Figure 8 inaccurately reflect the true impact on total government expenditures.

Figure 12 displays the expenditure dependency ratio (normalized to 1976) which takes account of these differential servicing costs to the public sector.[30] An increase in this index implies an 'easing' in public sector expenditures (in the sense that there are more working age people available to support an 'equivalent youth'), while a decrease in the index suggests a heavier burden. The index was above 1976 levels throughout the 1920s, the 1930s, and much of the 1940s, but declined with the advent of the postwar baby-boom, the effects of which lasted through the 1960s. The public sector costs of servicing these young people (at 1976 equivalent levels) are reflected in the index, which is below 1976 levels throughout

30 This rather crude measure has been constructed by applying weights of 2½: 1 to those aged 65 and over and those aged zero to 14 respectively, and taking the ratio of the working-age population to this 'equivalent youth' total. This procedure assumes that the per capita support costs of these equivalent youths grow at the same rate as the per capita income of the working age population. The use instead of the zero to 17 age bracket for 'youths', which was the basis for the chosen weighting factor, would have a very minor effect on these calculations.

Figure 12: Expenditure dependency index, Ontario



this period. However, as the baby-boom generation entered the working-age population in the late 1960s and especially the 1970s, the index rose and is projected to continue to rise through the mid-1980s. This implies that

- demographic changes will reduce pressure on public sector expenditures for most of the 1980s.

However the index returns to 1976 levels in the late 1980s as a result of the increasing proportion of elderly in the population (Figure 8) who are relatively more costly to look after. These changes in the index are the result of demography alone, since no changes from 1976 relative servicing levels are incorporated into the calculations.[31] This means that

- the working age population in the 1990s will be required to transfer a larger proportion of their income to the dependants in the population than in the 1980s, assuming that the public servicing levels of 1976 are maintained.

These trends are relatvely insensitive to the alternative population projections presented earlier (Table 7). Since immigration to the province tends to contribute more persons to the working age population than to the 'dependent' population, higher levels of immigration contribute to higher ratios throughout the projection period, thereby implying a slight easing of pressure (in the above sense) on public sector expenditures, although the range is relatively narrow;[32] similarly, lower levels of fertility also contribute to higher ratios, but again the range is narrow (Table 7). In short, these conclusions on expenditure dependency hold for a wide range of alternative assumptions.

Using these data it is possible to estimate the costs to the public sector of the projected demographic changes (under the assumption of maintaining the 1976 service levels). At

31 An increase in the relative public servicing costs of the elderly for example, would move the date earlier.

32 A change in this historical composition of the immigrant stream in the future, of course, could lead to a different conclusion.

1976 relative costs when an 'equivalent youth' was estimated to cost the public sector (including all levels of government) $1900 per year, the projected demographic changes result in increased annual expenditures (in 1976 dollars) by the public sector in the province of around one-quarter of a billion dollars in the early 1980s, rising to over $1.5 billion by the early 1990s and to $2.3 billion by 2001.[33] The allocation of these totals between the various levels of government in the province depends on intergovernmental transfers.

Table 7 indicates the sensitivity of these projected estimates in 2001 to alternative assumptions. The estimates imply that every additional 10 000 net immigrants a year to the province require approximately $173 million (in 1976 dollars) of additional public sector expenditures in 2001 to maintain existing (1976) service levels.[34] Perhaps not surprisingly, the range of estimates is quite wide, spreading more than $1 billion (1976 dollars) a year. The highest cost, almost $3 billion a year, is obtained with the high fertility assumption.

Recently Auerbach and Gerber (1976) and the Howe Research Institute (1979, chap. 5) have attempted to assess the impact of demographic changes on the distribution of government expenditures in Canada. Using an unpublished paper by Denton and Spencer, the Institute notes that demographically determined, constant quality government expenditures on social welfare, health, and transportation and communications are projected to grow faster than population, while those on education and protection are projected to grow more slowly than population in the thirty years between 1971 and 2001. The report also notes that over the historical period 1926-71 actual government expenditures more than tripled, while an

33 Allowing for an approximate rate of inflation of 20 per cent in the public sector since 1976 would increase these estimates to $0.270 billion, $1.889 billion, and $2.732 billion a year (early 1979 dollars) respectively.

34 This would be over $200 million in early 1979 dollars (see note 33). Since some of the immigrants may come from other provinces, their movement to Ontario would be offset by reductions elsewhere in Canada.

TABLE 7: Expenditure dependency under alternative projections, Ontario, 2001

Alternatives	Expenditure dependency index (1976 = 1.0)	Additional dependency costs ($1976 billion)
1976 Actual	1.000	0
P.T.F. = 1.85		
Net immigration/year		
zero	0.959	1.758
10 000	0.971	1.931
20 000	0.982	2.105
30 000	0.993	2.277
40 000	1.003	2.450
50 000	1.014	2.623
60 000	1.023	2.796
Net immigration = 30 000		
Terminal P.T.F.		
1.50	1.035	1.808
1.65	1.011	2.082
1.75*	0.993	2.277
1.85	0.975	2.473
2.20	0.932	2.951

*Projection outlined in section 2.

increase of slightly more than 30 per cent was all that was needed to maintain constant quality with respect to changes in The size and the composition of the population. Consequently, historically at least, population increase and changes in the age-sex composition of the population have not been dominant factors in the growth of government expenditures. The Institute points to increased urbanization and reduced family size as being possible explanations of this 'residual.' But the demographic impact cannot be ignored, especially with regard to the mix of government expenditures. As noted by Auerbach and Gerber, perhaps the biggest challenge will not arrive until early in the next century when the baby-boom generation finally reaches retirement age. It is not too early to begin preparing

for this development because, for example, expenditures on housing, transport and communications, health care, pensions will all be affected.

Government revenues and intergovernmental transfers

The effects of population changes on government expenditure become less clear both quantitatively and geographically as one moves from specific sectors (such as pensions, health, and education) to the total mix of expenditures. On the revenue side there is even less evidence to rely on, although the effects on revenues may well prove to be almost as important. In the Ontario budget the largest revenue sources are the personal income tax, payments from the federal government, and the retail sales tax, followed by corporation taxes, health insurance premiums, gasoline taxes, and Liquor Control Board of Ontario (LCBO) profits (Foot, 1977a). Probably several if not all of these items are affected by population growth and changing composition.

Consider, first, the personal income tax, much of which is paid by persons in their middle to late income-earning years. Since the most populous age groups are currently teenagers, with their maximum income-earning years presumably ahead of them, it seems reasonable to expect that the changing age composition of the population in the province will generate higher average revenues.[35] Increases might be expected also in gasoline tax revenues as this group actively enters the market for automobiles and in retail sales revenues. The changing age structure will bring smaller percentages of spending on tax-exempt items such as food and children's clothing and larger percentages on taxable items such as appliances and entertainment. Moreover, personal budgets are likely to be slanted towards more highly taxed items, such as restaurant meals, entertainment, and liquor, presumably enhancing LCBO profits, another important revenue source. Health premiums are

35 A reduction of the unemployment rate might be expected to increase these revenues, while an increase might be expected to reduce them.

collected through payroll deductions on employed persons, so that these can be expected to vary directly with employment in the province.[36] These are the kinds of revenue effects that might be generated, but without empirical analyses it is impossible to judge their quantitative importance.

However, a crude approximation based on the demographic projections may be attempted for intergovernmental transfers. Using the population projections Table 8 summarizes the implications for dependency in selected age groups in the population in 1976 and 2001. The pre-school group makes extensive demands on the provincially sponsored health care system; the school group makes heavy demands on the educational system, which is considered a local responsibility under most current jurisdictions in Canada; the university group makes its demands felt through post-secondary education, a provincial responsibility; and the seniors rely on the federally administered pension schemes and on the provincially supported health care system. The question is how the changes in demand implied in Table 8 will affect the various levels of government.

Over this period the pre-school age group increases only 1.2 per cent and declines slightly in relative importance; the savings in provincial health expenditures from this group will probably be minimal. On the other hand the school group suffers an almost 10 per cent decline in absolute numbers and a decline of over 7½ per cent in relative importance; this decline suggests a reduction in local expenditures under the traditional approach of including education in local government. The decline in the post-secondary age group is not as great - 7½ per cent in absolute numbers and slightly over 2 per cent in relative importance; however, 'resources' might be 'released' from this source, which is a provincial responsibility. Finally,

36 To the extent that employment follows the working age population (or labour force), these revenues can be directly projected from the population projections described in sections 2 to 4. See also note 35.

TABLE 8: Comparisons of dependency, Ontario, 1976 and 2001

Age groups	1976		2001		Percentage Difference
	Number (thousands)	Percentage	Number (thousands)	Percentage	
Pre-School: 0 - 4	607.2	13.91	61.47	13.29	-0.62
School: 5 - 19 years	2 274.6	52.11	2 056.3	44.47	-7.64
University: 20 - 24 years	744.4	17.05	688.3	14.88	-2.17
Seniors: 65+ years	738.9	16.93	1 265.1	27.36	+10.43
Total	4 365.1	100.00	4 624.4	100.00	0.00

unlike each of the three previous age categories the seniors show a 71.2 per cent increase in numbers and more than a 10 per cent increase in relative importance. If seniors were solely a federal responsibility, and if funds were apportioned in proportion to relative numbers, these projections suggest that jurisdictional responsibilities would require the transfer to the federal government of $10.43 for every $100 spent on these age groups, with $2.79 (or 27 per cent) coming from the provincial government and $7.64 (or 73 per cent) coming from local government. Under these very simplified assumptions an increase in the size of the federal government relative to the other levels of government in Canada is implied.

Acknowledging that a significant proportion of government expenditure on the senior age group takes the form of provincial health care modifies the above numbers. Note that, under the assumption of proportional funding, $6.61 of $10.43, or over 60 per cent of expenditures on the senior age group, would have to be from provincial sources to maintain their relative position vis-à-vis the federal government.[37]

37 Let x be the amount of provincially supported senior expenditure required to maintain the equality - $2.79 + x = 10.43 - x, which implies that x = 6.61.

Of course, actual government expenditures are not proportional to the absolute numbers for various reasons. As noted above, it has been estimated that per person government expenditures are three times as great for older dependants as for youths in the United States and 2½ times as great in Canada. This fact suggests that the impact on intergovernmental transfers will be even more heavily biased towards those levels of government responsible for the elderly than is suggested by the above crude calculations.[38]

In summary, one trend seems clear: the declining demand for educational services provided at the local level in Canada and in Ontario will likely diminish the expenditures of local government over the next twenty-five years and reduce with it the importance of provincial-municipal transfers (Foot, 1978). As for the relative sizes of the federal and provincial governments, and consequently the importance of federal-provincial transfers, the direction of change depends on the relative proportion of government services provided to the elderly by the two levels of government and the cost of these services compared to the resources released at the provincial level from the educational system. Without quantitative evidence it is difficult to project the impact of demographic change on intergovernmental transfers (and hence on the provincial budget). However, an educated guess might suggest that both the federal and provincial government expenditures will increase compared to local government expenditures and that federal expenditures will increase compared to provincial expenditures. But as with all demand-oriented expenditure projections it is important to emphasize that supply responses, an essential feature of intergovernmental negotiations in Canada, are ignored.

Since quantitative estimates of the impact of demographic changes on government revenues and intergovernmental transfers

38 Since these calculations are only intended to be suggestive, no attempt has been made to trace out the effects under alternative projections. These can be explored by examining Table 2.

are not yet available, it is not possible to project their effects on the over-all provincial budget. Such a task appears overdue.

6 SUMMARY AND CONCLUSION

This paper has examined the economic implications of projected demographic changes in Ontario to the turn of the century. The population projection showed: (i) average annual population growth around 1 per cent a year through the mid-1980s, gradually declining to one-half of 1 per cent by 2001; (ii) a steady increase in the percentage of persons in the population aged 65 and over to more than 12 per cent at the turn of the century; (iii) a steady and even larger decrease in the percentage of pre-working-age persons; and, consequently, (iv) a higher proportion of the population of working age throughout the projection period than was experienced in the previous sixty years.

The sensitivity of the population projection to the chosen assumptions showed the projected age-sex composition and numerical dependency ratio to be relatively insensitive to the choice of alternative assumptions. Projected populations for the province in 2001 under the alternatives considered ranged from 9.5 million to 11.1 million persons, depending on the net immigration assumption.

Annual labour force growth, based on conservative assumptions, was projected to be well above 1 per cent until the mid-1980s and to remain above population growth throughout the projection period. Consequently, a general labour shortage in the 1980s and 1990s appears unlikely. The labour force will contain a continually smaller proportion of young people. Projections based on alternative participation rate assumptions suggest that increases of up to 3 per cent in the terminal (2001) figure may well be possible. The labour force projections were shown to be insensitive to alternative fertility assumptions, as was the age-sex composition of the labour force. Obviously the size of the labour force, projected to be

more than 5 million persons by 2001, is sensitive to alternative immigration assumptions.

It is more difficult to predict the impact of these demographically induced demand changes on the level and mix of total government expenditures. The 'pension ratio' (persons aged 65 and over divided by the working age population) was projected to rise by 32 per cent over the projection period assuming a fixed ratio of benefits to earnings. However, this projected increase can be offset by increases in labour productivity growth of slightly above 1 per cent - not a particularly high figure by historical standards. Demographic changes can be expected to have countervailing impacts on the aggregate saving rate; whether or not this rate will also be influenced by existing pension arrangements remains an unresolved issue. The asymmetric U-shaped relation between health costs and age implies that the projected demographic changes are likely to lead to increases in real per capita health costs of about 17 per cent and a need to redistribute resources towards hospitals and services for the elderly. On the other hand projected enrolment trends suggest that resources could be released from the education sector. The trends projected are currently established in the elementary school system and are beginning to be experienced in the secondary school system. Although the growth at the post-secondary level has clearly subsided, actual declines likely will not occur in this system until the mid-1980s. Wave-like enrolment patterns are likely to be a characteristic of all levels of the education system into the distant future, although the peaks in enrolments are unlikely to reach previously experienced levels.

Expenditure dependency, which recognizes the higher per person cost of public support to the aged compared to the young, suggests reduced 'pressure' on public sector expenditures from demographic changes for most of the 1980s; but the working age population of the 1990s will be required to transfer a larger proportion of their incomes to the 'dependants' in the population if the current public servicing

levels are to be maintained. It was estimated that the projected demographic changes will require an additional $2.3 billion (in 1976 dollars) a year in total public expenditures in the province by 2001 to maintain existing servicing levels. It does appear that (constant quality) expenditures on social welfare, health, and transportation and communications programs are likely to grow faster than population, while those on education and protection are likely to grow more slowly.

Evidence of demographic changes on the level and mix of government revenues is sparse. Although a number of effects can be clearly envisaged, their quantitative importance is a subject for future research. However, crude measures suggest that local government will become less important compared to the provincial government, which in turn may become less important compared to the federal government. But, as mentioned, the measures are still rudimentary.

Post-war events have taught us that surprises are not unusual in demography. However, as if surprises were not perplexing enough, recent experience shows that 'even the inevitable is sometimes unexpected' (Howe Research Institute, 1979, 125). The baby-boom, for instance, appears to have caught each succeeding level of the education system unprepared. Another example is the current high levels of youth unemployment. Demographic changes clearly affect the labour force growth and output potential of the economy, the manpower requirements of the labour market, and the budgetary priorities of government. Population projections and an analysis of their policy implications should be an integral part of the development of public policy in Ontario and elsewhere.

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